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Survey of Potential Bio-pesticidal Plants in Manipur

D.S. Ningombam [1]* and Somananda Thokchom [2]
[1] Department of Botany, Jadonang Memorial College, Longmai, Noney, Manipur, India.
[2] CSIR-NorthEast Institute of Science & Technology, Branch Laboratory, Lamphelpat, Imphal, Manipur, India.
*Corresponding author email id: deshworjit@gmail

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Abstract **– Today there is a global search for alternatives to chemical pesticides and as part of this process there are various efforts to test the use and efficacy of natural products for pest control and crop protection. Extensive survey was conducted from 2017 to 2019 to explore and document plants which can be used as bio-pesticides in all the valley districts of Manipur. The data collection was based on the previous records of the plants which have bio-pesticides properties to treat and manage a wide range of diseases of crops of the plants. The present survey recorded 29 plants namely, *Justicia adhatoda* L., *Mentha spicata* L., *Andrographis paniculata* (Burm.f.) Nees, *Sida rhombifolia* L., *Allium tuberosum Rottler ex. Spreng*., *Allium sativum* L., *Meliaazedarach* L., *Bidenspilosa* L., *Impatiens balsamina* L., *Vitexnegundo* L., Stachytarpheta cayennensis (Rich.) Vahl, *Daturametel* L., *Lantana camara* L., *Cassia alata* L., *Cariya papaya* L., *Imperata cylindrical* L., *Amaranthus spinosus* L., Mikania cordata (Burm.) B.L. Robinson, Mikania micrantha Kunth, *Ageratum conyzoides* (L.) L., Ageratum houstonianum Mill., *Tageteserecta* L., Zingiber officinale Roxb., *Equisetum debile* L., Artemisia nilagirica (C.B. Clarke) Pamp., Hyptissuaveolens (L.) Poit., *Jatropacurcas* L., Ocimumgratissimum L.and Plectranthustenuicaulis (Hook.f.) J.K.Morton. The distribution status and availability reveals that 55.17 % were found in wild and 44.82% in cultivated form. Among, the growth forms used herbs (44.82%) were the highest follows by shrubs (41.37%), trees and climbers (6.89%) each respectively. The valley districts are rich in biodiversity of bio-pesticides plants and there is need for further studies to validate their use as potential drugs for pests and disease control. It is high time to set up village based bio-pesticides units where a range of these products can be prepared following standard protocols, thus providing valuable inputs to sustainable agriculture and a means of livelihood to rural farmers and women in Manipur.**

Keywords **– Bio-pesticides, Growth Forms, Pets, Sustainable Agriculture.**

I. INTRODUCTION

Bio-pesticides are eco-friendly pesticides which are obtained from naturally occurring substances plants, animals and microbes. It is considered to be important part of IPM (Integrated pest management programme) because they are substitute to synthetic pesticides. Research reveals that several groups of phytochemicals from plants such as alkaloids, steroids, terpenoids, essential oils and phenolics and have been successfully exploited for controlling several plants disease. Some bio-pesticides currently being developed may be excellent alternatives to chemical pesticides. There are several plants species known to possess some insecticidal, antifungal and antibacterial properties. Some of the popularly known locally available plants like *neem*, *garlic*, *eucalyptus*, *pine* etc which can be easily processed and increase the biopesticide consumption in India. Moreover, some of the commercially and widely used biopesticides in India are Bt (Dipel, Xentari, Gnatrol), NPV, neem based pesticides (Azadirachtin Azatrol and Neemix), Trichoderma etc.

In recent years, the use of synthetic, organic insecticides in crop pest control programmes around the world has resulted in damage to the environment, pest resurgence, pest resistance to insecticides and lethal effect on non-target organisms (Ranasingh 2007; Krishna et al. 2013; Gahukar 2012; Thimmaiah 2010). There are many

cases of acute occupational pesticide poisoning in developing countries are being reported each year. Farmers in their traditional wisdom have identified and used a variety of plant products and extracts for pest control, especially in storage. As many as 2,121 plant species are reported to possess pest management properties, 1005 species of plants exhibiting insecticide properties, 384 with anti-feedant properties, 297 with repellant properties, 27 with attractant properties and 31 with growth inhabiting properties have been identified (Ranasingh, 2007).

The state Manipur is lying in the Indo-Burma Biodiversity Mega Hotspots which ranks in the 8th amongst the 34th biodiversity hotspots of the world (Meyers et al. 2000). In terms of physical features, two parts, the hills and the valley, with the valley surrounded by hills on all sides and situated at an altitude of 790 metres above sea level (Vedaja 1998). It has a rich diversity of plants originates from the variations in the climatic and edaphic factors. Manipur being an underdeveloped state has the highest record of using of chemical fertilizers and pesticides in Northeast India accordingly to Basic Statistics of NER (2002). Most of chemical fertilizers used are used in valley ecosystem where paddy and vegetables items of the state were met. Agriculture sector has a vital place in the economy of the state. It contributes a major share to the State domestic product; about 52 % of the workers in Manipur are engaged as cultivators and Agricultural labourers. However, the low input intensity of agriculture of the state makes it ideally suited for organic cultivation. Manipur being a predominantly agricultural economy has vast potential forbio-pesticidal plants by capitalizing on the organic and eco-friendly nature of agricultural and horticultural product of the state, significant gains may be achieved in the burgeoning market for organic products.

The present research has been carried out to explore the potential bio-pesticidal plants available which have been reported previously for their insecticidal activity for controlling plant diseases and offer the people an effective, low cost, sustainable and environment friendly pest.

II. MATERIAL AND METHODS

Extensive survey was conducted from 2017 to 2019 to explore and document plants which can be used as bio-pesticides in all the four valley districts of Manipur. The data collection was based on the previous records of the plants which have bio-pesticides properties to treat and manage a wide range of diseases of crops of the plants following reports of Singh 1993; Balasubramanian 2008; Singh 1993; Thimmaiah 2010; Ranasingh 2007; Balasubramanian et al. 2008; Krishna et al. 2013; Islam &Morshed 2013; O'Brien et al 2009; Gahukar 2012 and Mwine et al. 2011 and secondly, information on the use of plants and products was collected from farmers and knowledgeable persons.

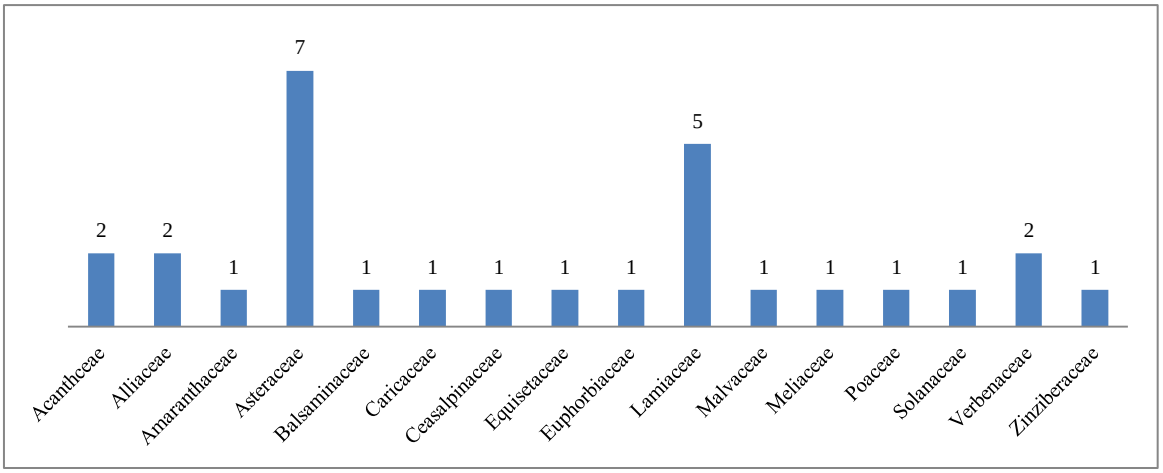
The dominant cereal is paddy which constitutes the staple food of Manipur. The other crops is maize, horticultural crops like pineapple, lemon, orange, banana, guava and peaches and vegetables like cabbage, potato, cauliflower, mustard etc.

The plants collected were identified and confirmed by following works of Clarke, 1884; Kanjilal et al. (1934-1940); Deb (1961 a, b). Author name of plants follows Brummit & Powell 1992, plant names index. All the species were thus updated following above literature in their scientific names. The herbarium sheets are prepared following Jain and Rao 1977 and deposited for inclusion in the herbaria of Department of Life sciences, Manipur University, India.

III. Result and Discussions

In the present study a total of twenty nine species belonging to 15 families of angiosperms and 1 from pteriodophytes were recorded from the study areas which have potential bio-pesticidal uses **Appendix-1**. The maximum species of bio-pesticidal plants was recorded from Asteraceae followed by Lamiaceae with 7 and 5 species respectively. The following Table-1 shows the families with the number of species.

Table 1. Showing families and number of species of bio-pesticidal plants.



The growth forms of the species recorded was highest in herbs (44.827%) follows by shrubs (41.379%), tree (6.896%) and the least in climber (6.896 %).

The distribution status and availability of the recorded plants reveals that 55.17 % were found in wild and 44.82% in cultivated form. Some of the commonly available and which can propagate easily are *Justicia adhatoda* L., *Mentha spicata* L., *Allium tuberosum* Rottler ex Spreng, *Allium sativum* L., *Melia azedarach* L., *Artemisia nilagirica* (C.B.Clarke) Pamp, *Ocimum gratissimum* L., *Jatropha curcas* L., *Zingiber officinale* Roscoe, *Tagetes erecta* L., *Cariya papaya* L., *Datura metel* L., *Vitex negundo* L. and *Andrographis paniculata* (Burm.f.) Nees.

Some of the species are commonly available and are invasive in nature viz. *Lantana camara* L., *Sida rhombifolia* L., *Stachytarpheta cayennensis* (Rich.) Vahl, *Bidens pilosa* L., *Impatiens balsamina* L., *Cassia alata* L., *Imperata cylindrical* L., *Mikania cordata* (Burm.) B.L. Robinson, *Mikania micrantha* Kunth., *Ageratum conyzoides* L., *Ageratum houstonianum* Mill., *Hyptis suaveolens* (L.) Poit., whereas *Equisetum debile* L., and *Plectranthus tenuicaulis* (Hook.f.) J.K. Morton., are two species which were found in wild.

Among the 29 species recorded botanical pesticides 24.137% have previous report of uses in Manipur and 75.862% of the species does not have earlier knowledge of its pesticide uses. The species which were used by the *manipuris* for it bio-pesticide purpose are *Allium tuberosum* (Nakupi), *Allium sativum* (Chanam), *Melia azedarach* (Seizrak), *Vitex negundo* (Urikshibi), *Lantana camara* (Nongbanlei), *Tagetes erecta* (Sanarei) and *Artemisianilagirica* (Laibakgou) against agricultural and horticultural crops.

IV. Conclusion

This paper highlighted on important plants having pesticidal efficacy and their activities against agricultural products were commonly available in the state. Bio-pesticides could provide a new generation of agricultural

pest management products that are sustainable both from an environmental and health perspective. However, its adoption by farmers in Manipur has to be motivated for maximizing gains. Moreover it is high time for the state government support, to train the insufficient farmers and to provide market information and market access constraints. Also, the establishment of bio-pesticide units in rural areas, where such plants are available, will also provide employment to the dwellers.

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AUTHOR'S PROFILE

First Author
Dr. Deshworjit Singh Ningombam obtained his Ph. D degree from Manipur University in 2012 and M Phil from Periyar University Salem. He had published more than 15 International and National papers, 3 books and has worked in many National and State projects on forest inventory, medicinal & PBR's. His area of interest is plant taxonomy and Ethnobotany. email id: deshworjit@gmail.com

Second Author
Mr Somananda Thokchom is working as Technical Officer in CSIR-NorthEast Institute of Science & Technical, Branch Laboratory, Lamphelpat, Imphal. He did M.Sc Biotechnology from Kurukshetra University. He has published various research papers in reputed journals and presented his research findings in various national seminars & conferences. His area of interest is Plant biotechnology and Ethnobotany. email id: som123456thoc@gmail.com